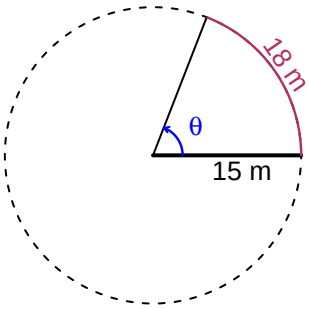
Name: Date:

Trig Final (Solution v47)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 18 meters. The radius is 15 meters. What is the angle measure in radians?

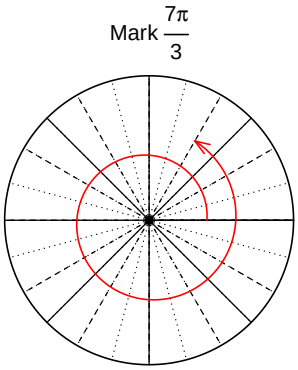


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

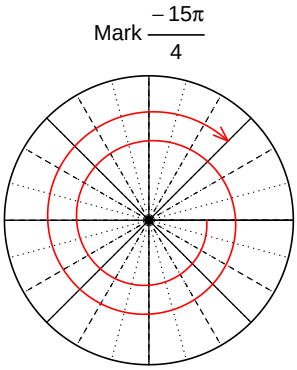
$\theta = 1.2$ radians.

Question 2

Consider angles $\frac{7\pi}{3}$ and $\frac{-15\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{7\pi}{3}\right)$ and $\sin\left(\frac{-15\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(7\pi/3)$



Find $\sin(-15\pi/4)$

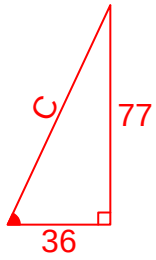
$\cos(7\pi/3) = \frac{1}{2}$

$\sin(-15\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-77}{36}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

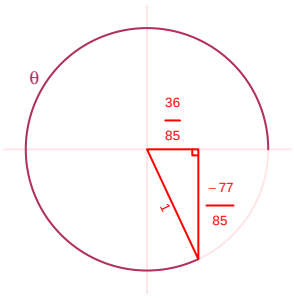
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + 77^2 = C^2$$
$$C = \sqrt{36^2 + 77^2}$$
$$C = 85$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{36}{85}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 8.73 meters, a frequency of 4.93 Hz, and a midline at $y = -7.22$ meters. At $t = 0$, the mass is at the maximum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 8.73\cos(2\pi 4.93t) - 7.22$$

or

$$y = 8.73\cos(9.86\pi t) - 7.22$$

or

$$y = 8.73\cos(30.98t) - 7.22$$